

IN THE CLAIMS

Please amend Claims 1, 2, 5 and 11, to read as follows.

1. (Currently Amended) A piezoelectric element comprising:

a piezoelectric film sandwiched between a lower electrode and an upper electrode,

wherein said lower electrode is formed of a first material, said piezoelectric film is formed of a second material, and said upper electrode is formed of a third material,

wherein said lower electrode and/or said upper electrode and said piezoelectric film comprise perovskite oxide,

wherein an interface between said lower electrode and/or said upper electrode and said piezoelectric film does not exist, and

wherein (i) a region where containing crystals of said ~~lower electrode~~ first material and/or said upper electrode and crystals of said piezoelectric film are mixed second material exists between said lower electrode and/or said upper electrode and said piezoelectric film, and/or (ii) a region containing crystals of said second material and crystals of said third material exists between said piezoelectric film and said upper electrode.

wherein said mixed region spreads in a direction of thickness of said piezoelectric film:

2. (Currently Amended) A piezoelectric element according to claim 1,

wherein each of said mixed regions has a perovskite structure.

3. (Original) A piezoelectric element according to claim 1, wherein said lower electrode, said upper electrode and said piezoelectric film comprise perovskite oxide manufactured by a sol-gel method.

4. (Previously Presented) A piezoelectric element according to claim 1, wherein each of said lower electrode and said upper electrode comprises a material represented by a general formula M^1RuO_3 (M^1 indicates at least one kind selected from Sr, Ba and Ca) or $Sr_{(1-x)}M^2_xCoO_3$ (M^2 indicates at least one kind selected from La, Pr, Sm and Nd; and $0 \leq x < 1$) and said piezoelectric film comprises a material represented by a general formula $Pb_{(1-x)}La_x(Zr_yTi_{1-y})O_3$ ($0 \leq x < 1$, $0 \leq y \leq 1$).

5. (Currently Amended) An ink jet recording head comprising:
a pressure chamber communicated with an ink discharge port;
a vibrating plate provided in correspondence to said pressure chamber; and
a piezoelectric element provided in correspondence to said vibrating plate and
having a piezoelectric film sandwiched between a lower electrode and an upper electrode,
wherein ink in said pressure chamber is discharged from said ink discharge
port by a change of volume in said pressure chamber caused by said piezoelectric element,
wherein said lower electrode is formed of a first material, said piezoelectric
film is formed of a second material, and said upper electrode is formed of a third material.
wherein said lower electrode and/or said upper electrode and said piezoelectric
film comprise perovskite oxide,

wherein an interface between said lower electrode and/or said upper electrode and said piezoelectric film does not exist, and

wherein (i) a region ~~where~~ containing crystals of said lower electrode first material and/or said upper electrode and crystals of said piezoelectric film are mixed second material exists between said lower electrode and/or said upper electrode and said piezoelectric film, and/or (ii) a region containing crystals of said second material and crystals of said third material exists between said piezoelectric film and said upper electrode.

~~wherein said mixed region spreads in a direction of thickness of said piezoelectric film.~~

6. (Withdrawn) A method for manufacturing a piezoelectric element having a piezoelectric film sandwiched between a lower electrode and an upper electrode, comprising, in the following order:

a step for providing an electrode material for forming said lower electrode on a substrate;

a step for drying the electrode material;

a step for providing a piezoelectric material to form said piezoelectric film on the electrode material;

a step for drying the piezoelectric material; and

a step for sintering the electrode material and the piezoelectric material.

7. (Withdrawn) A method according to claim 6, wherein a step for sintering the electrode material is not performed after said step for drying the electrode material

and before said step for providing the piezoelectric material for forming said piezoelectric film on the electrode material.

8. (Withdrawn) A method for manufacturing a piezoelectric element having a piezoelectric film sandwiched between a lower electrode and an upper electrode, comprising, in the following order:

- a step for providing a piezoelectric material for forming said piezoelectric film on said lower electrode;

- a step for drying the piezoelectric material;

- a step for providing an electrode material for forming said upper electrode on the piezoelectric material;

- a step for drying the electrode material; and

- a step for sintering the piezoelectric material and the electrode material.

9. (Withdrawn) A method according to claim 8, wherein a step for sintering the piezoelectric material is not performed after said step for drying the piezoelectric material and before said step for providing the electrode material for forming said upper electrode on the piezoelectric material.

10. (Withdrawn) A method for manufacturing a piezoelectric element in which at least an electrode and a piezoelectric film are laminated, comprising:

a step for providing a laminated structure of an electrode material for forming said electrode before sintering and a piezoelectric material for forming said piezoelectric film before sintering and;

a step for sintering said laminated structure.

11. (Currently Amended) A piezoelectric element comprising a piezoelectric film sandwiched between a lower electrode and an upper electrode,
wherein said lower electrode is formed of a first material, said piezoelectric film is formed of a second material, and said upper electrode is formed of a third material,

wherein an interface between said lower electrode and/or said upper electrode and said piezoelectric film does not exist, and

wherein (i) a region where containing crystals of said ~~lower electrode~~ first material and/or said ~~upper electrode~~ and crystals of said ~~piezoelectric film~~ are mixed second material exists between said lower electrode ~~and/or said upper electrode~~ and said piezoelectric film, and/or (ii) a region containing crystals of said second material and crystals of said third material exists between said piezoelectric film and said upper electrode.

wherein said mixed region spreads in a direction of thickness of said piezoelectric film: